

EXHIBIT 9



US006342725B2

(12) **United States Patent**
Falster

(10) Patent No.: **US 6,342,725 B2**
(45) Date of Patent: **Jan. 29, 2002**

(54) **SILICON ON INSULATOR STRUCTURE HAVING A LOW DEFECT DENSITY HANDLER WAFER AND PROCESS FOR THE PREPARATION THEREOF**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(21) Appl. No.: **09/737,715**

(22) Filed: **Dec. 15, 2000**

Related U.S. Application Data

(List continued on next page.)

(63) Continuation of application No. 09/387,288, filed on Aug. 31, 1999, now Pat. No. 6,236,104.

(60) Provisional application No. 60/098,902, filed on Sep. 2, 1998.

(51) Int. Cl.⁷ **H01L 29/06; H01L 27/01; H01L 27/12; H01L 31/0392**

(52) U.S. Cl. **257/618; 257/347; 257/617**

(58) Field of Search **257/347, 618, 257/913, 617**

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(57) **ABSTRACT**

The present invention relates to a process for the preparation of a silicon on insulator wafer. The process including implanting oxygen in a single crystal silicon wafer having an axially symmetric region in which there is a predominant intrinsic point defect which is substantially free of agglomerated intrinsic point defects. Additionally, the present invention relates to a silicon on insulator ("SOI") structure in which the device layer and the handle wafer each have an axially symmetric region which is substantially free of agglomerated intrinsic point defects. Additionally, the present invention is directed to such a SOI structure in which the handle wafer is capable of forming an ideal, non-uniform depth distribution of oxygen precipitates upon being subjected to the heat treatment cycles of essentially any arbitrary electronic device manufacturing process.

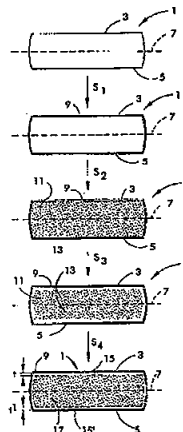
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42 Claims, 35 Drawing Sheets



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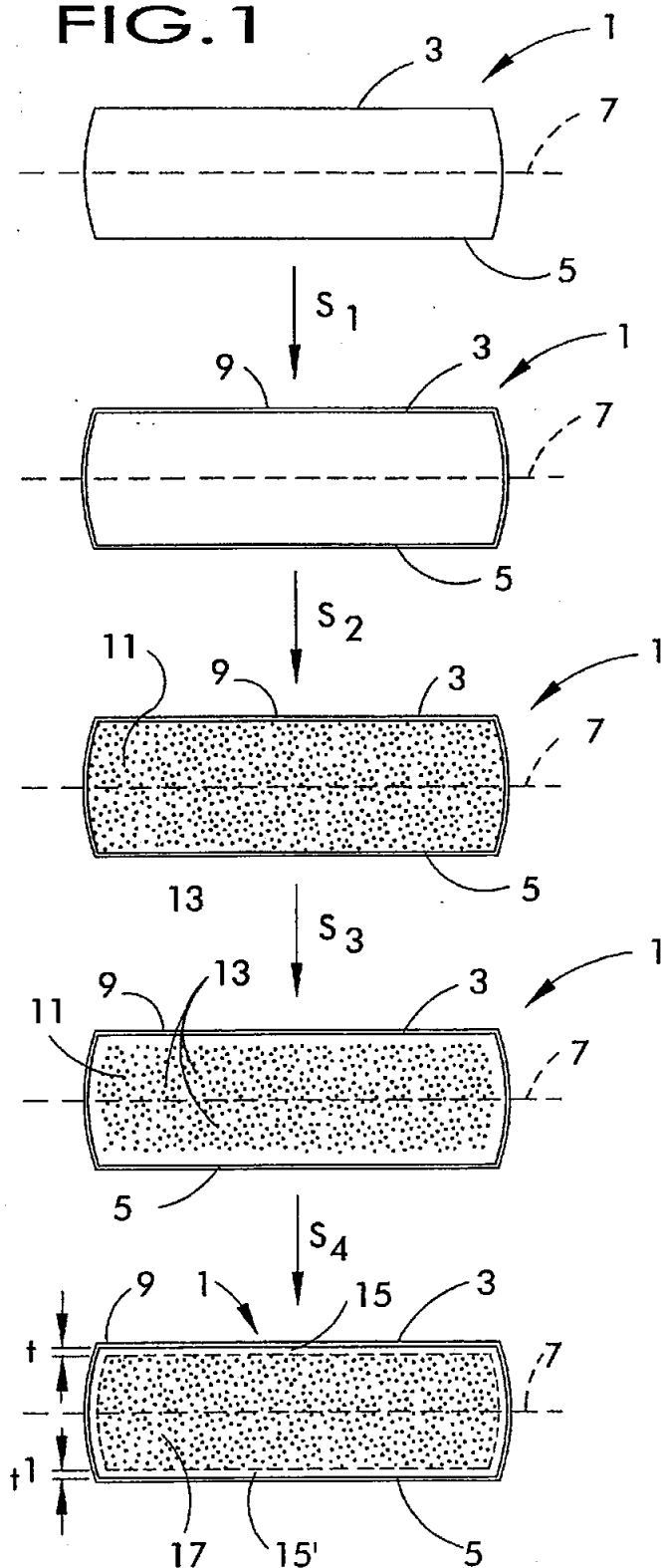
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FIG. 1



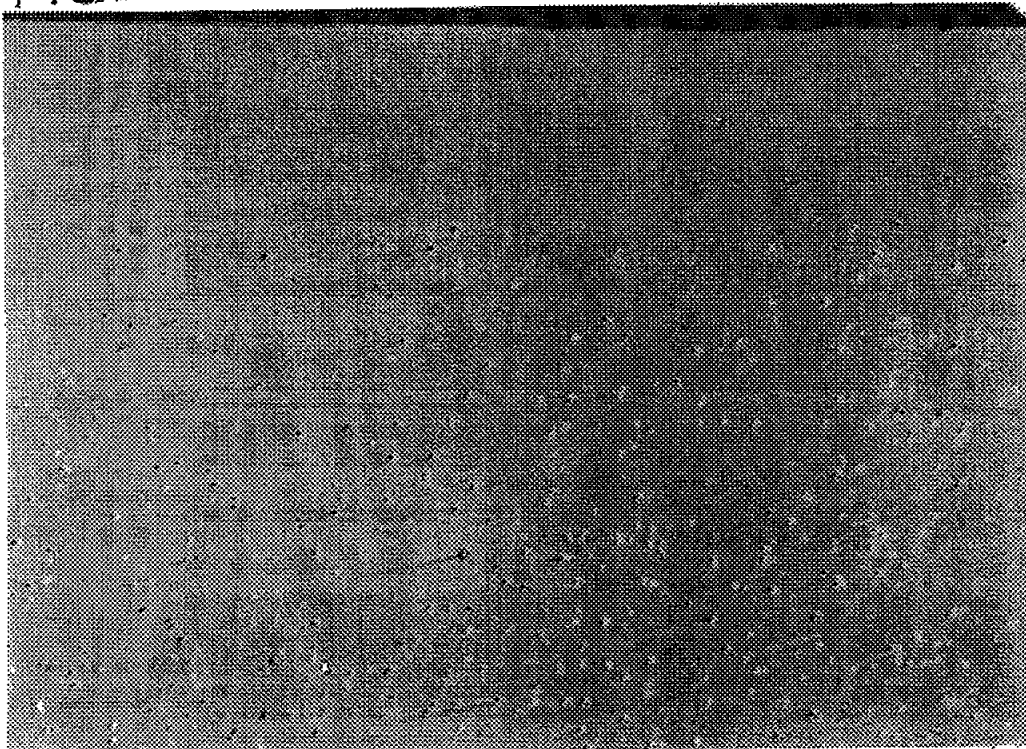
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FIG. 2



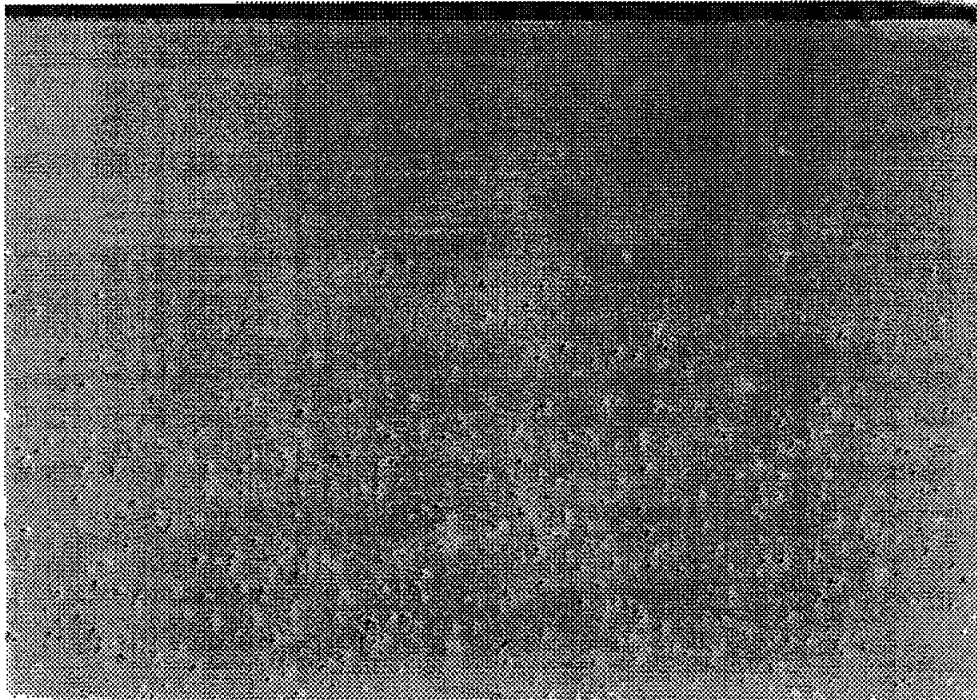
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FIG. 3



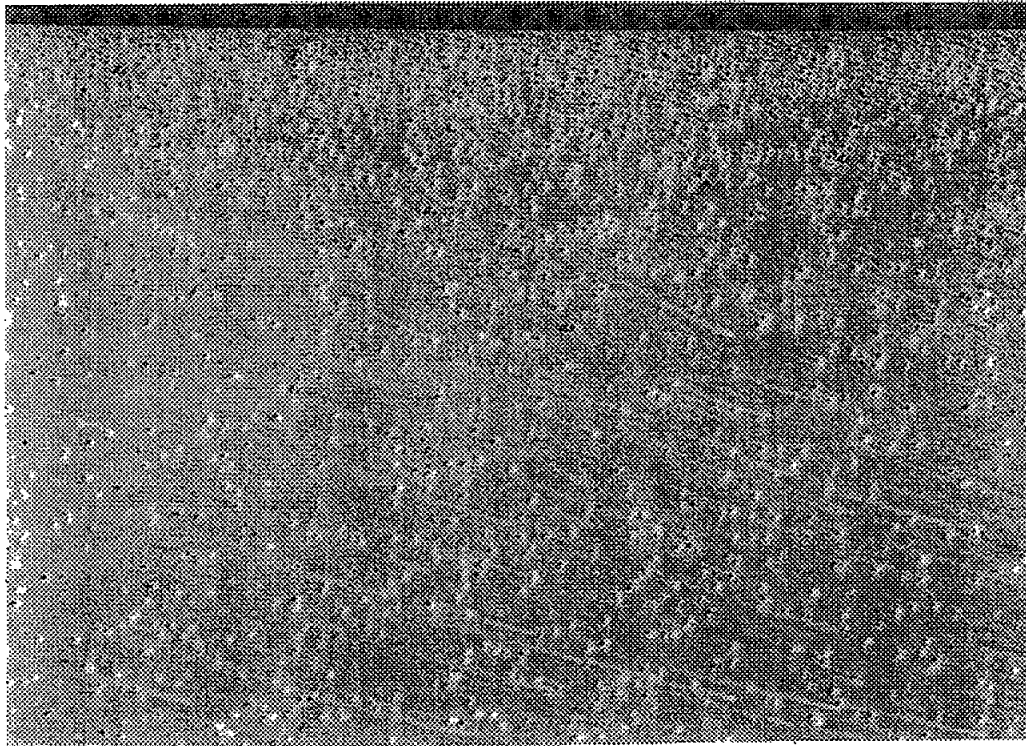
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FIG 4



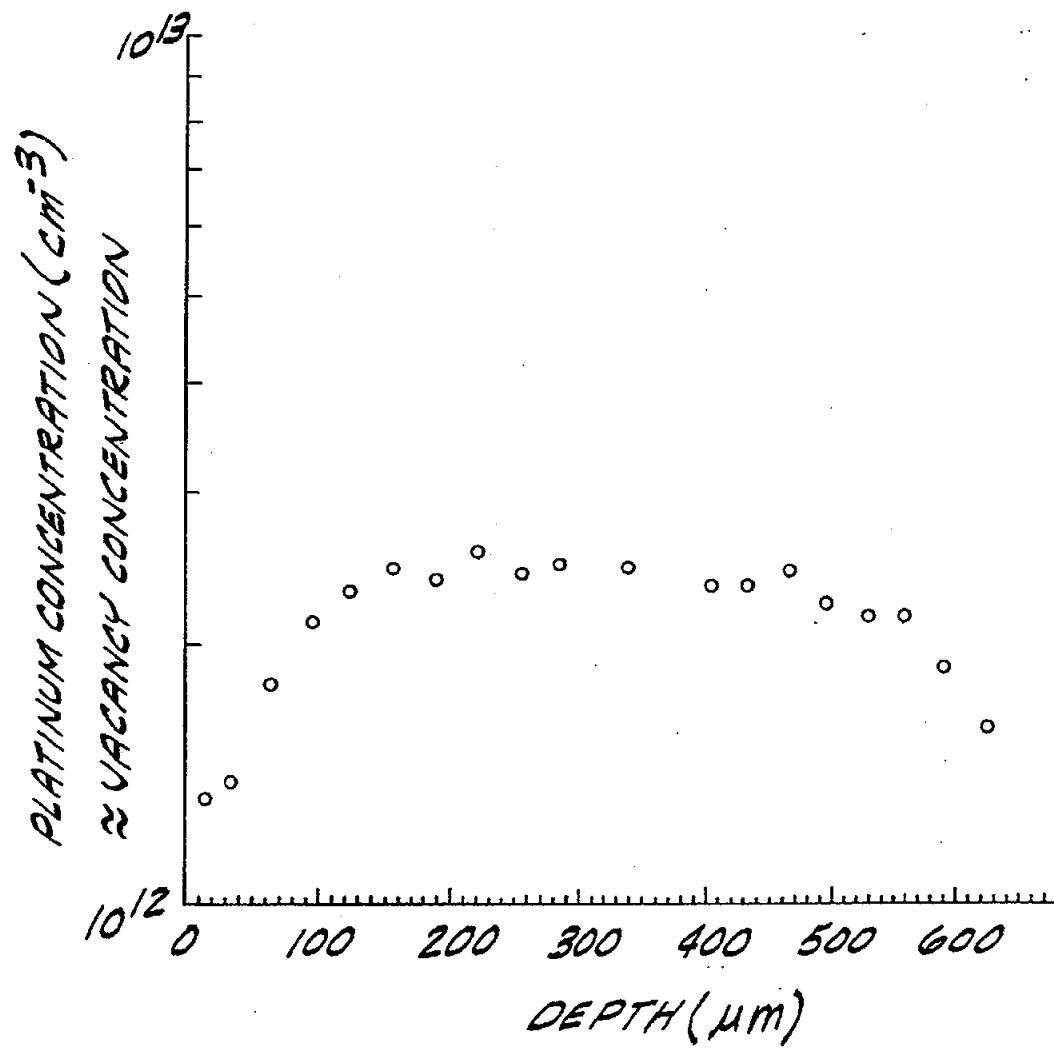
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FIG. 5



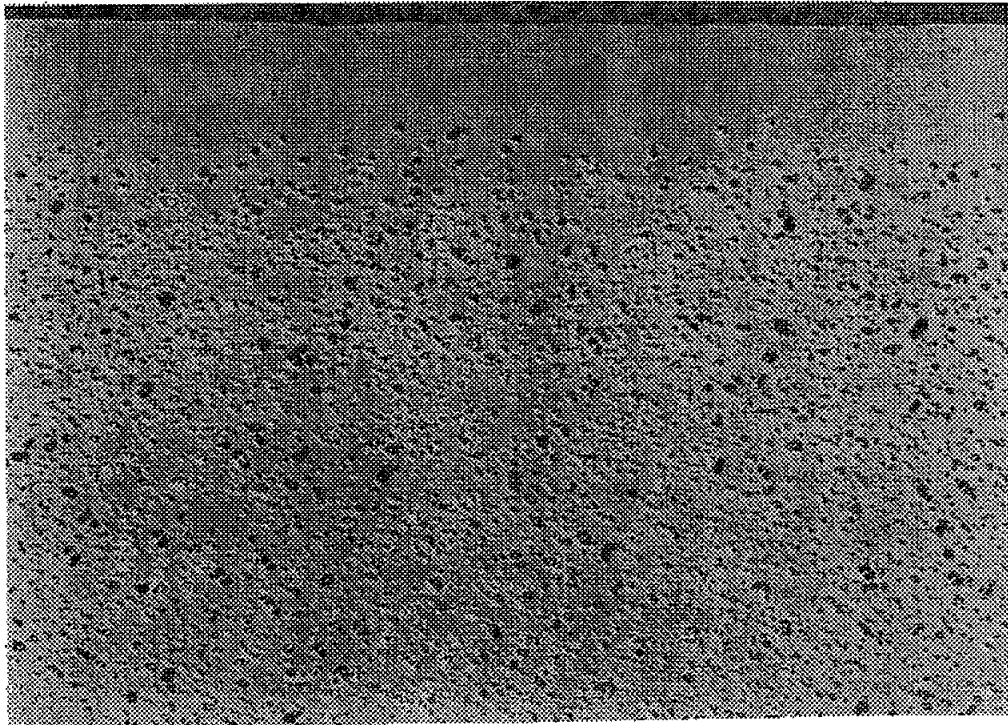
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FIG. 6



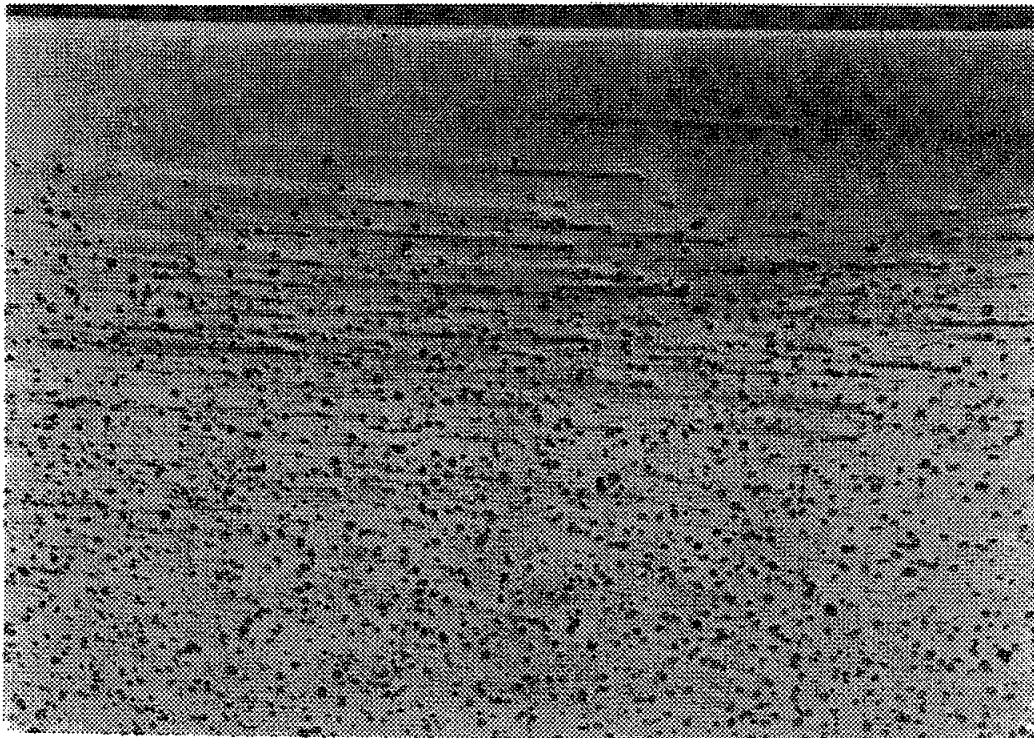
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FIG. 7



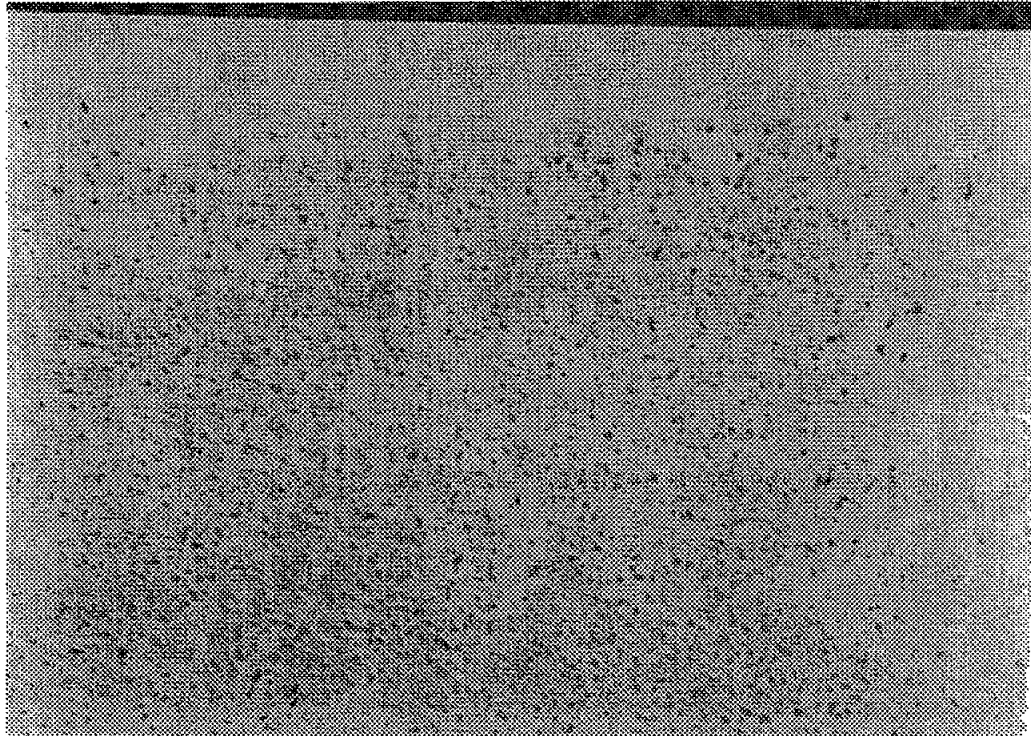
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FIG. 8



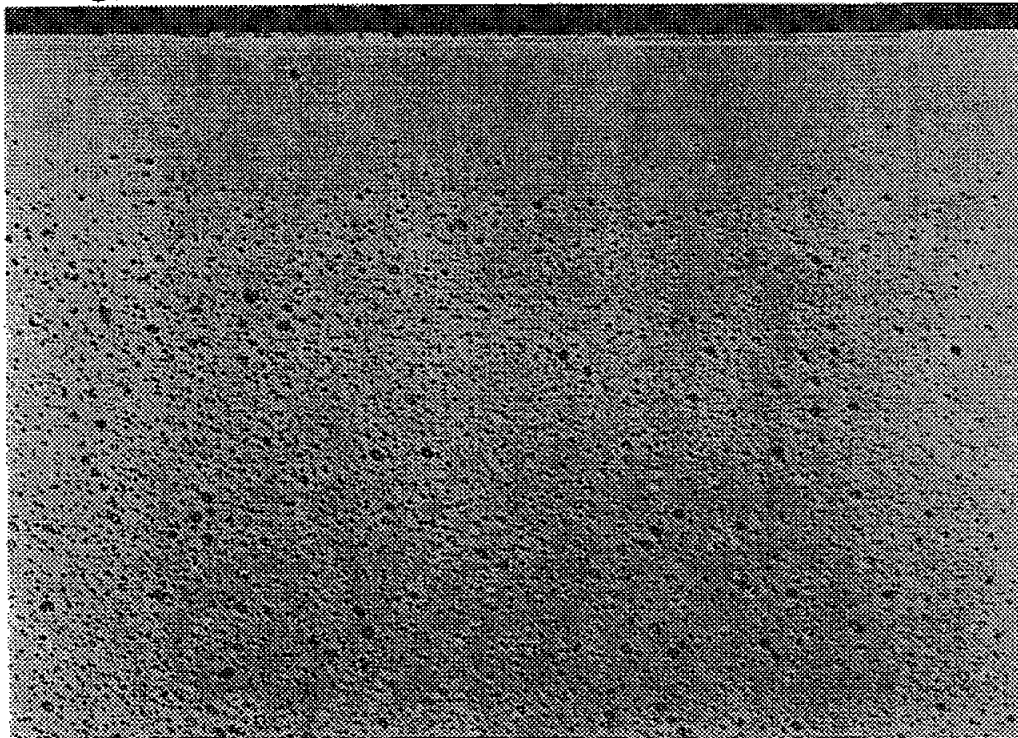
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FIG 9



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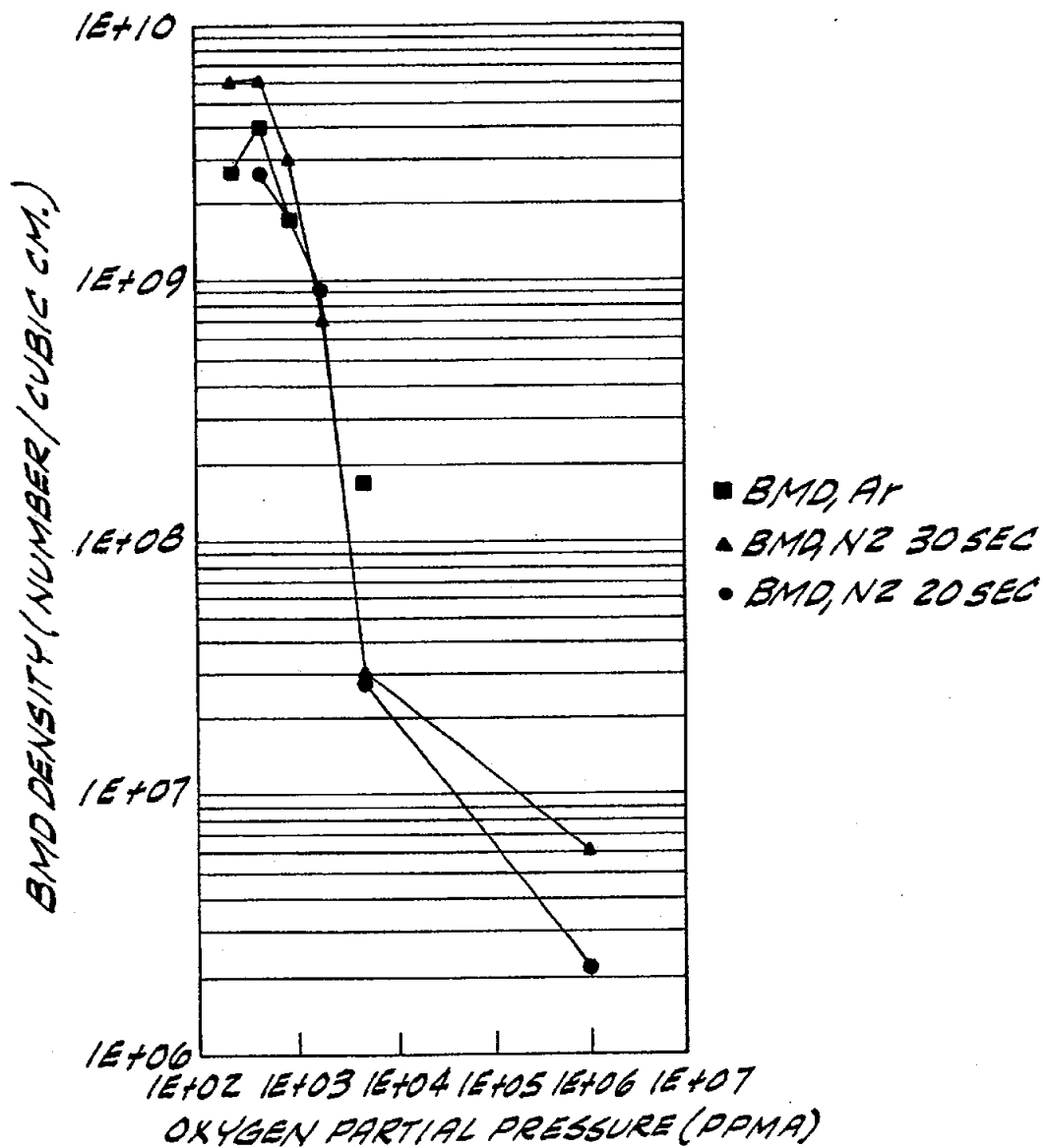
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FIG. 10

BMD DENSITY VS. OXYGEN PARTIAL PRESSURE



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FIG. 11

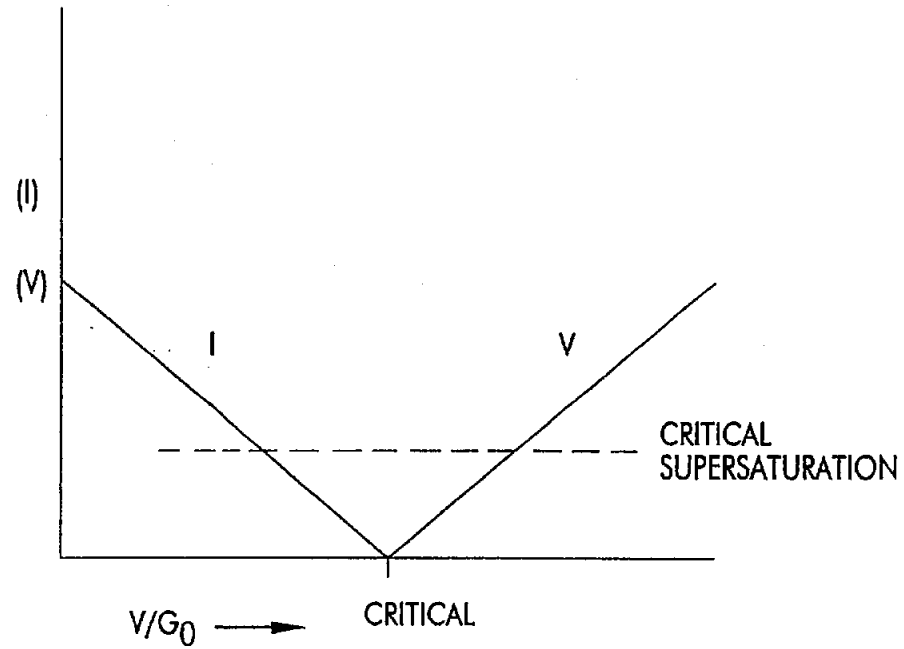
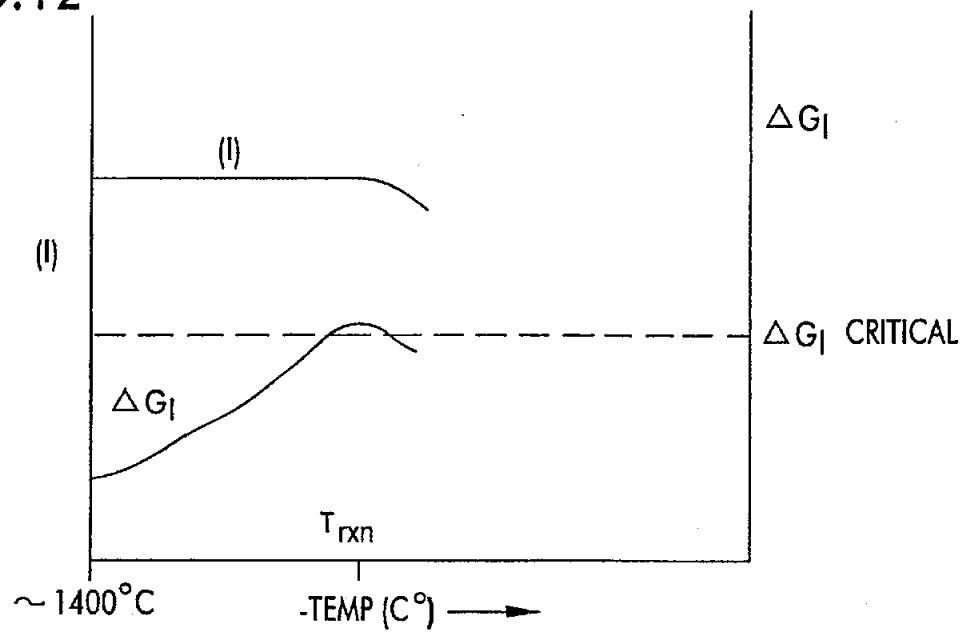


FIG. 12



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FIG.13

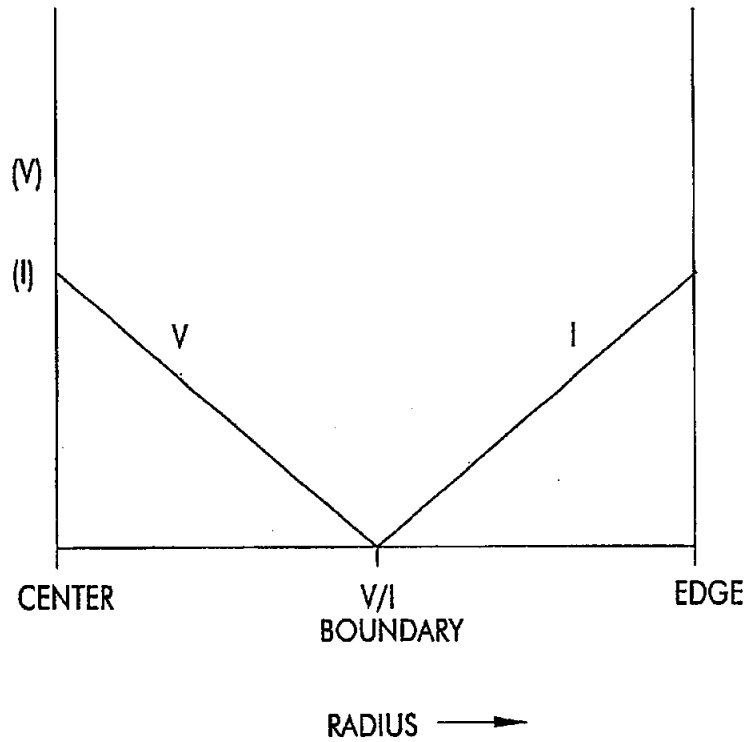
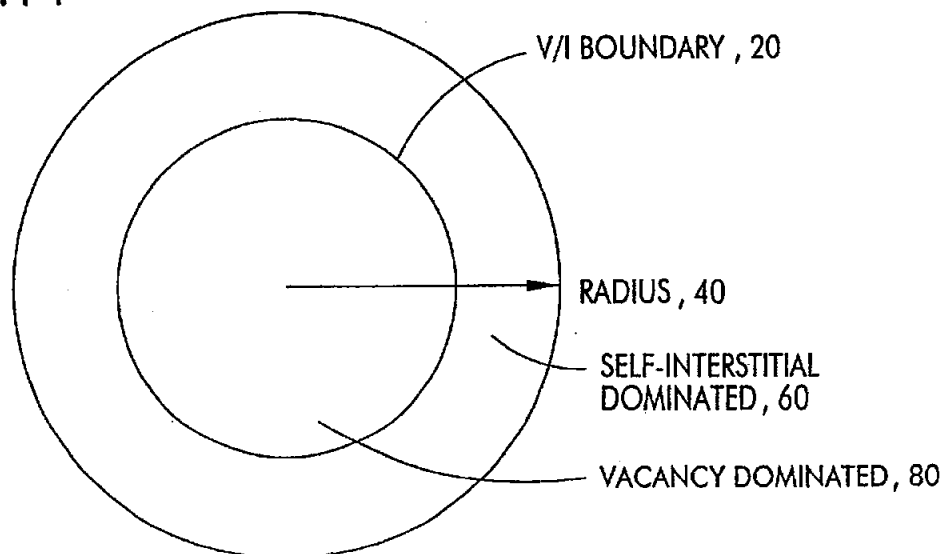


FIG.14



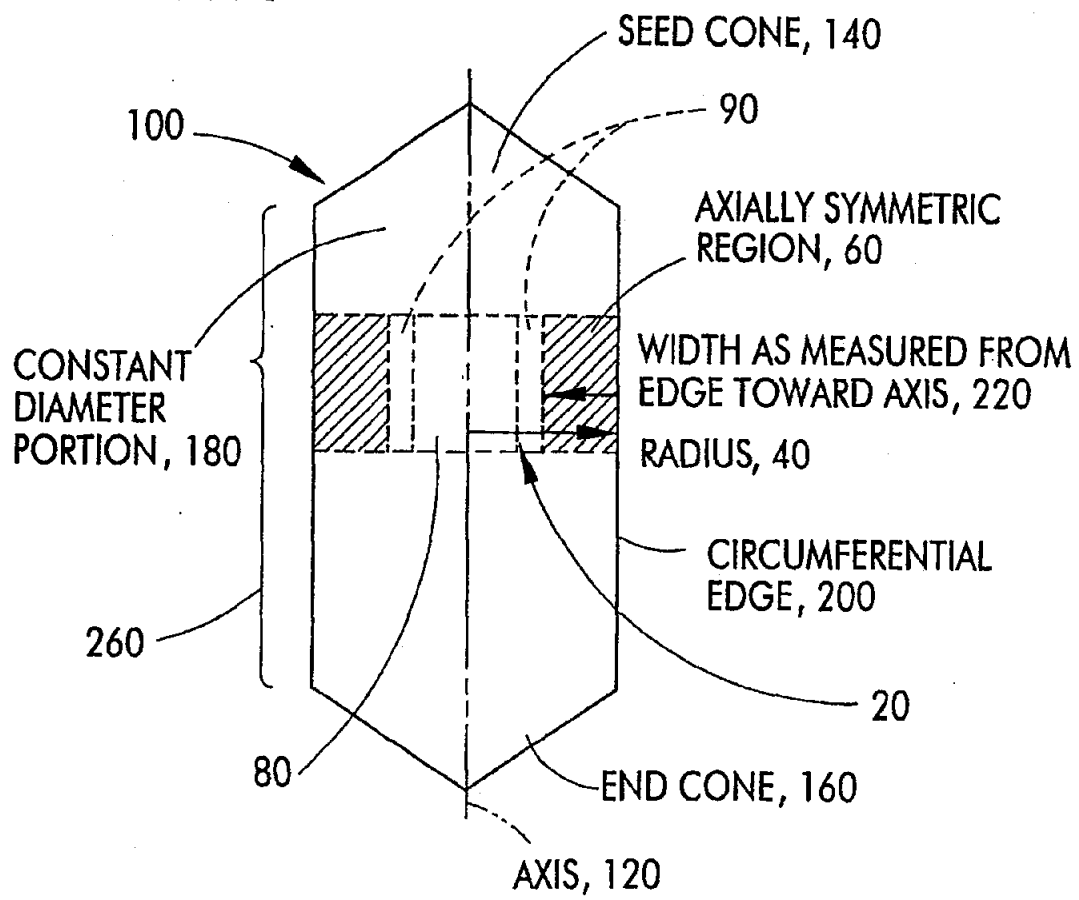
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FIG. 15



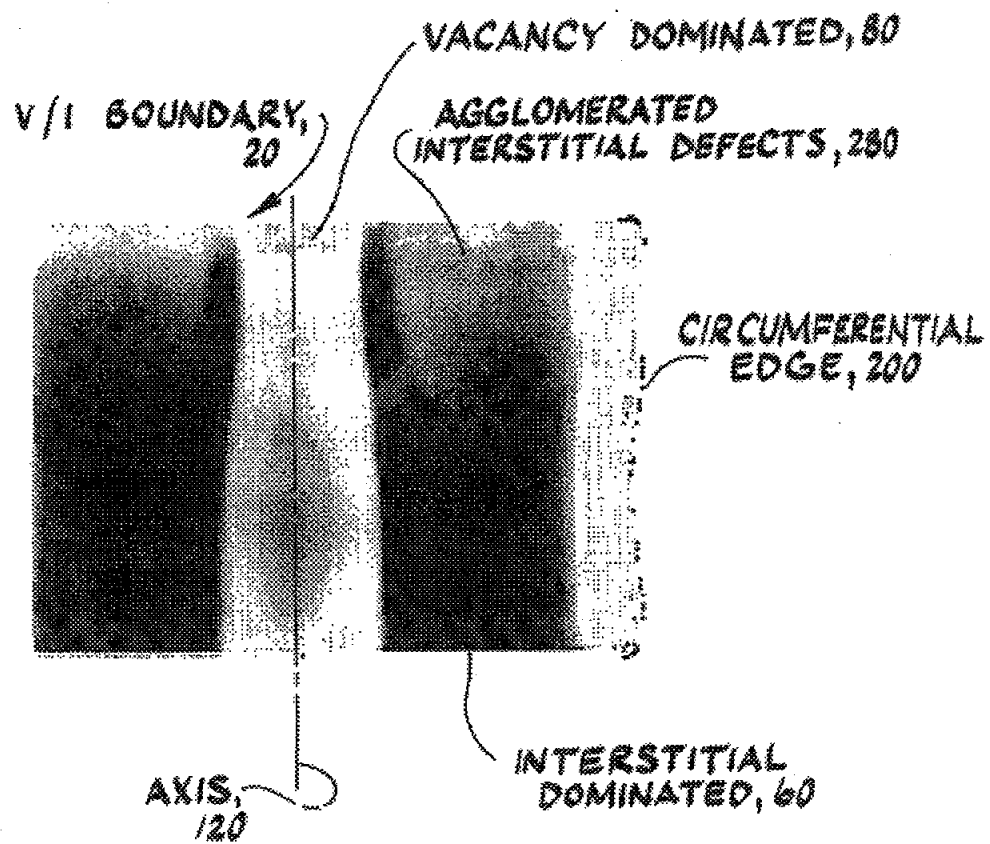
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FIG. 16



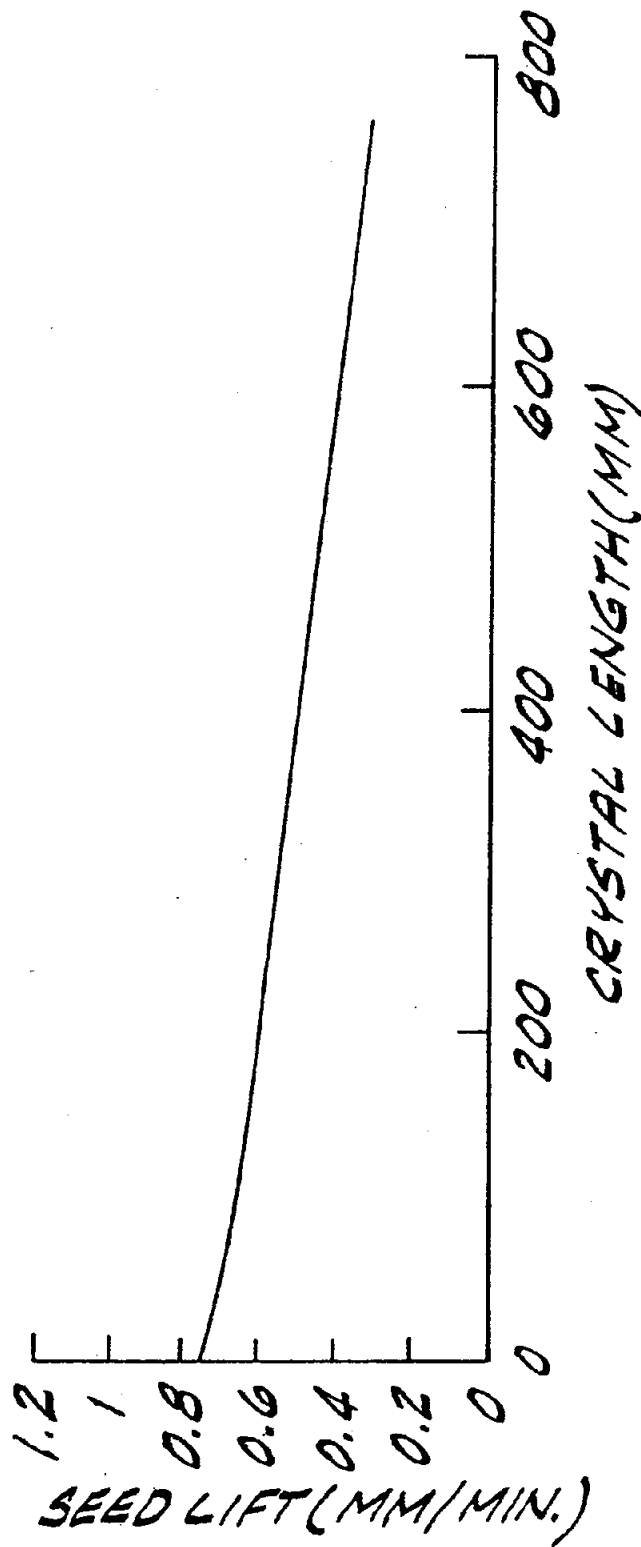
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FIG. 17



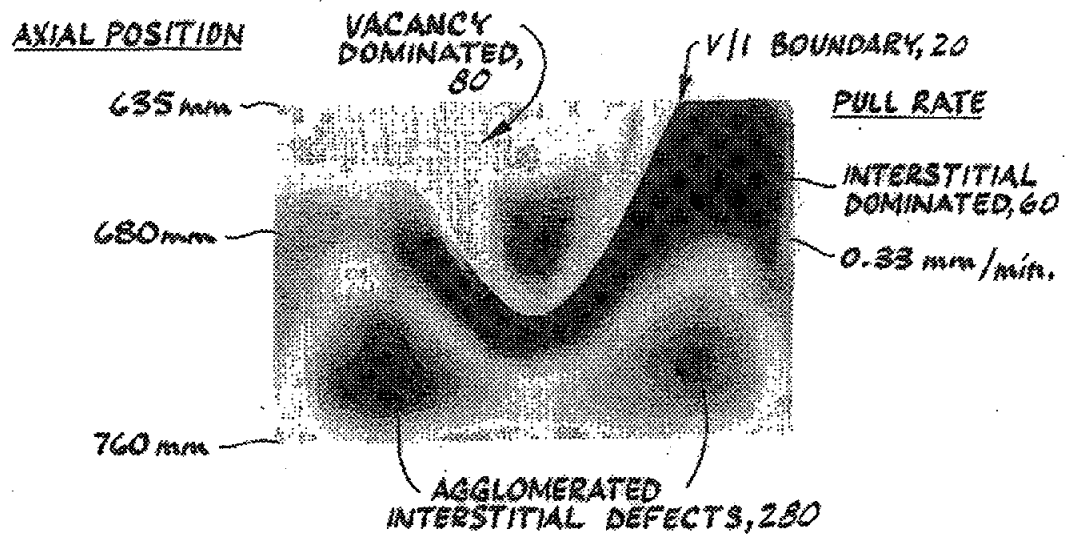
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FIG. 18



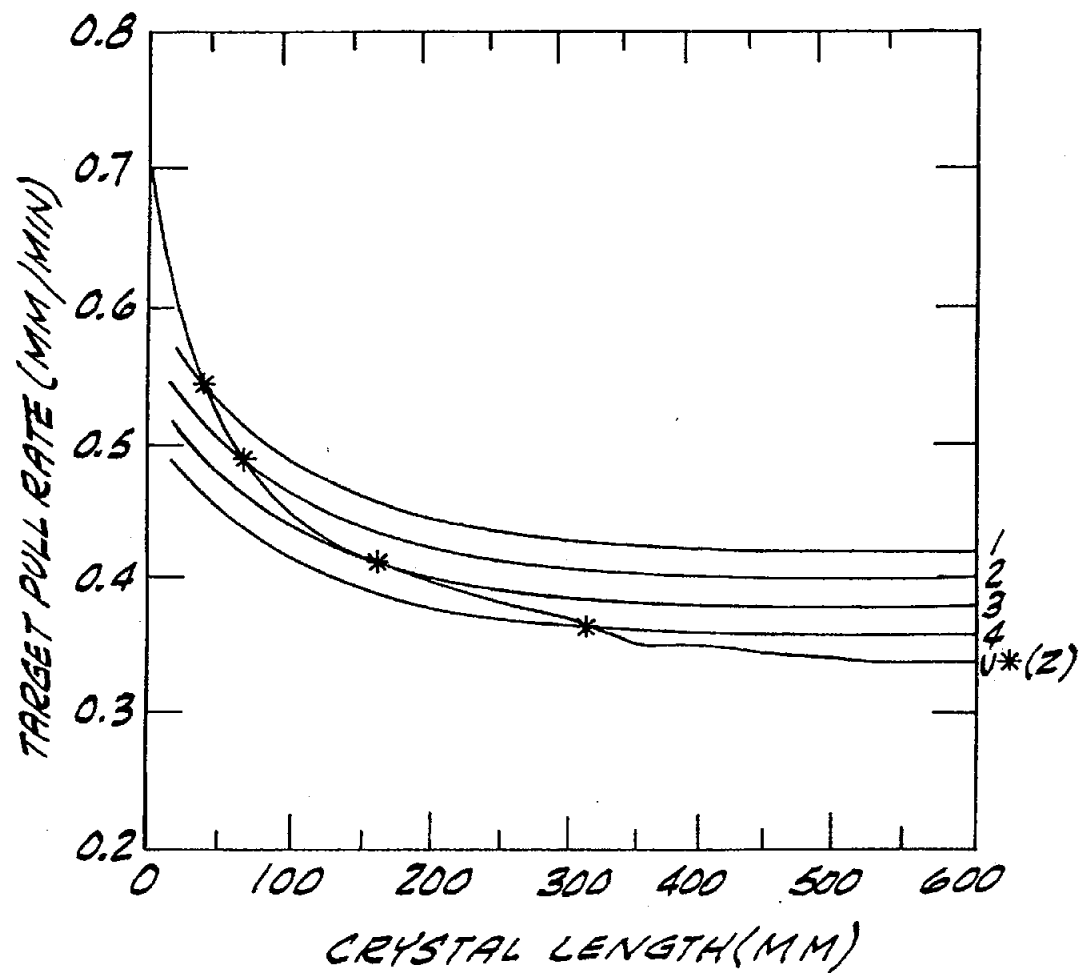
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FIG. 19



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FIG. 20

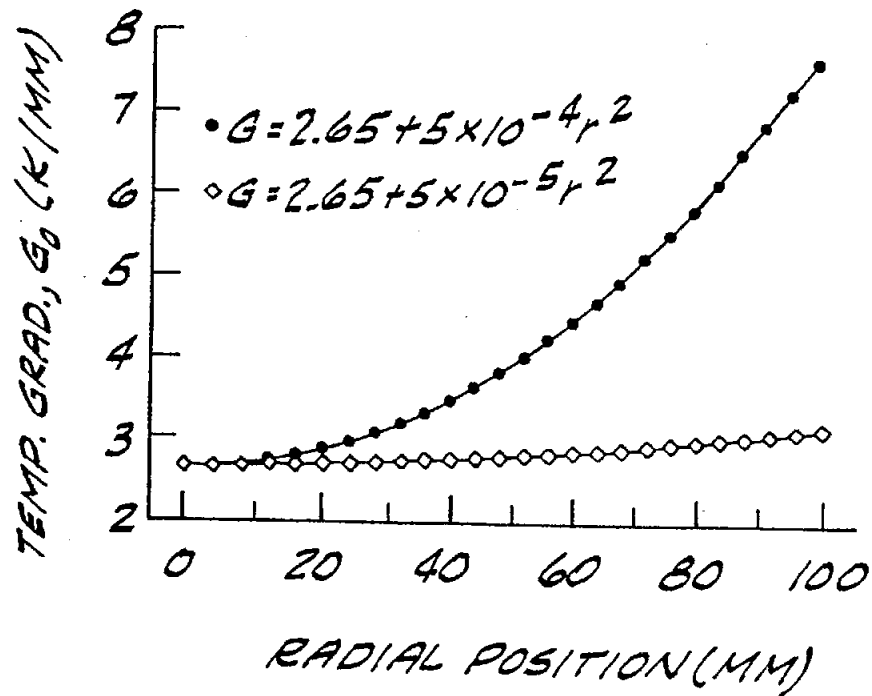
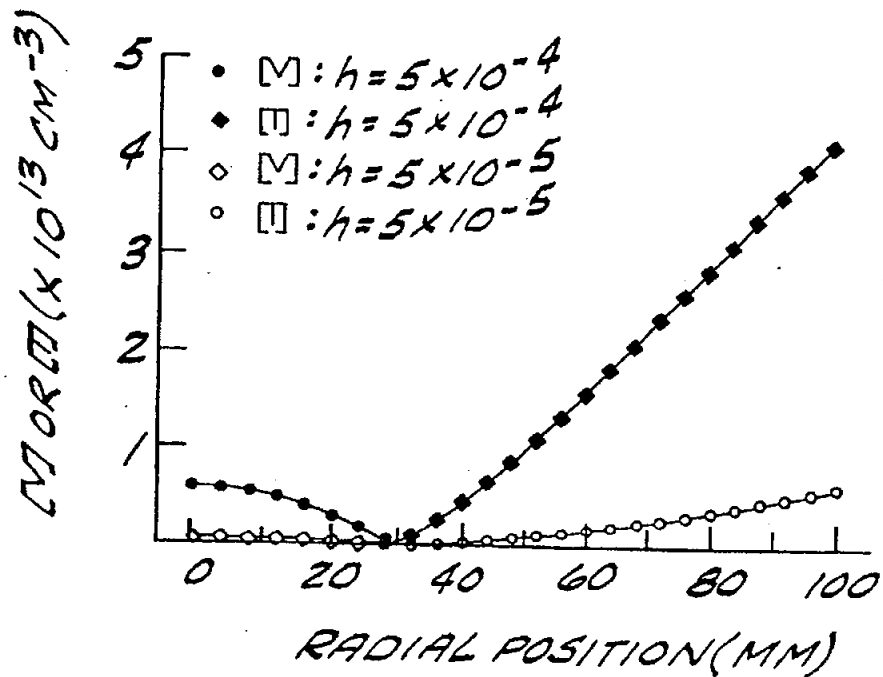


FIG. 21



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FIG. 22

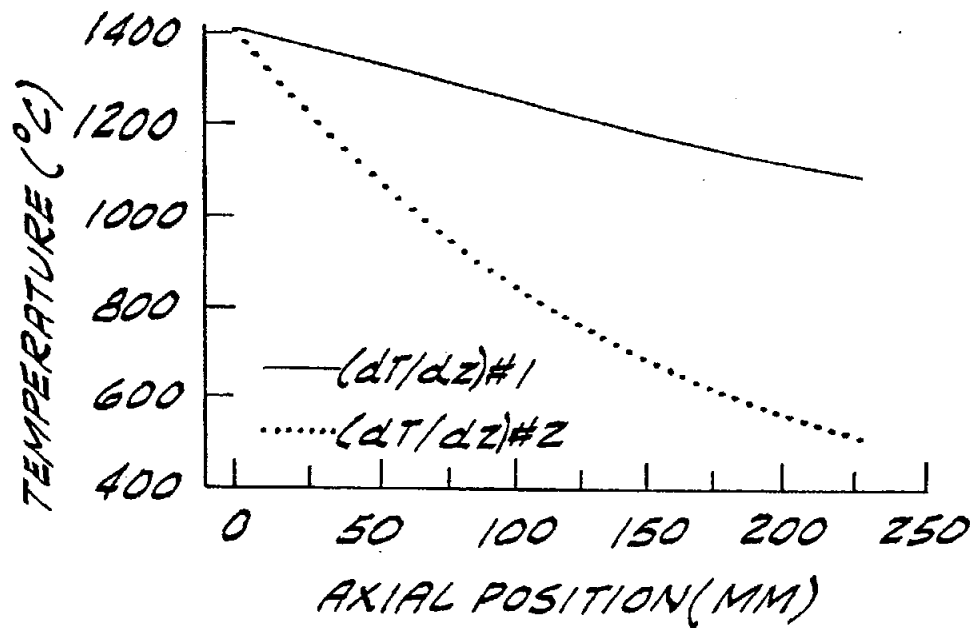
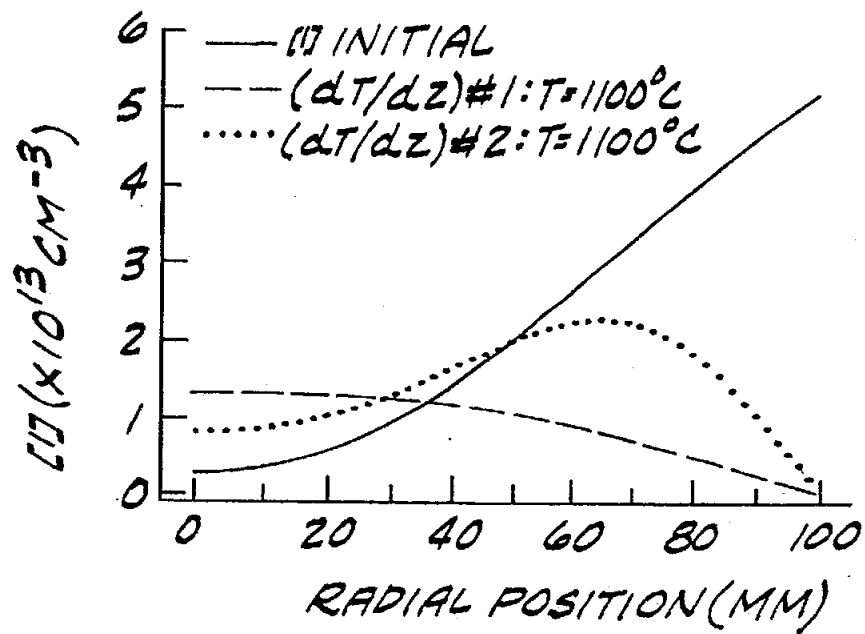


FIG. 23



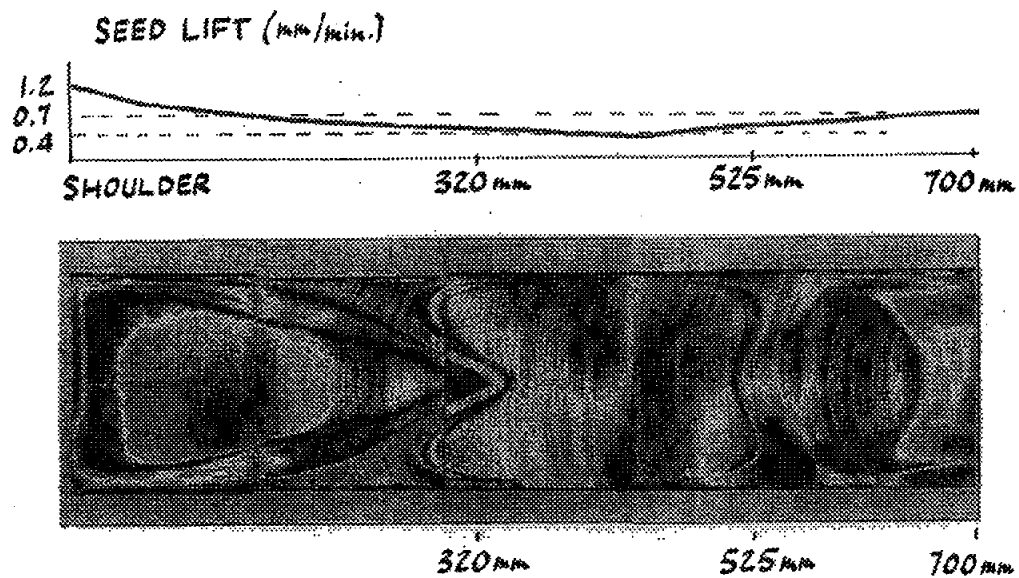
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FIG. 24



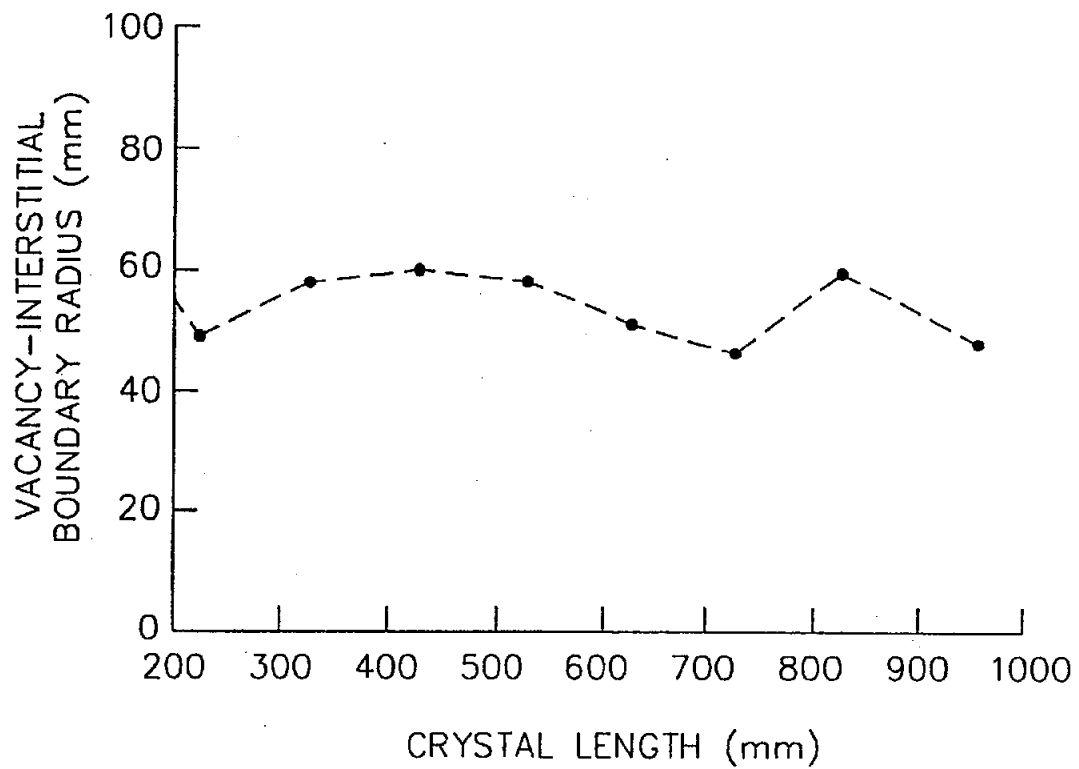
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FIG. 25



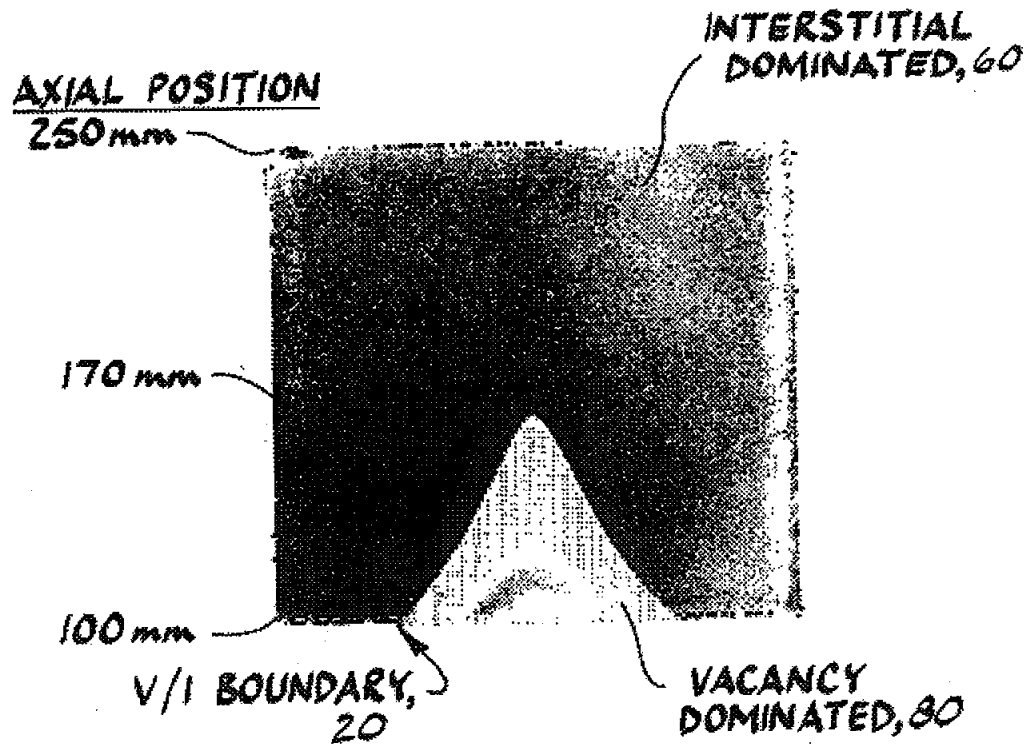
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FIG. 26A



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FIG. 26B

